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AUTHOR McCollum, Jeanette A.
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ABSTRACT

The paper describes the use of the z-score (an approach to predicting one member's behavior from the other's) for constructing a visual picture of the reciprocal interplay between an infant and caregiver. The approach taken was to divide the comparison of conditional to unconditional probabilities into four sets of scores and then to plot them together for visual analysis. Results of a dyad containing a Down Syndrome baby show that the baby spent more time looking at a toy than at the mother, while the mother looked more at the baby's face at younger ages and at the toy at the older ages. The analysis allows inspection of changing relationships over time and over settings. In general, the analysis suggested that the mother's gaze behavior was more dependent on the baby's than vice versa and that interdependence was generally more consistent in play than in instructional situations. Five figures are appended. (CL)

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Jeanette A. McCollum
Bureau of Educational Research
1310 S. 6th St.
University of Illinois
Champaign, IL 61820

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Poster Session
SOCIETY FOR RESEARCH IN CHILD DEVELOPMENT
Toronto, April, 1985

Depicting Developmental Change in the Degree and Direction of Interdependence within Dyadic States: Application to a Dyad with a Baby with Down Syndrome

Social interaction is a complex combination of modalities and patterns. When the partners in the interaction are infant and caregiver, it is also a continually changing phenomenon reflecting underlying developmental changes in the infant. During this process, communicative behaviors of each partner undergo alteration in both form and function, while concurrently maintaining major importance as regulators of the complementary roles of the two members. Changes in the degree and direction of interpersonal symmetry/asymmetry, through the medium of particular communicative behaviors, can serve as an indicator of this continual readjustment of roles.

One of the most common approaches to representing the degree of symmetry between dyadic partners is to use a z score to represent a comparison between the conditional probability of the joint occurrence of behaviors in each of the two members with the unconditional probability of occurrence of one of these behaviors alone, yielding a measure of the predictability of one member's behavior from the other (Gottman & Bakeman, 1979). Studies using this approach have addressed interpersonal symmetry in relation to a variety of combinations of interactive behaviors (e.g., gaze/gaze) and situations (e.g., en face play in infancy), chosen to define

interactive bouts of specific theoretical interest in relation to the developmental status of the infant. Typically, however, only one direction of dependence within the dyad (i.e., from infant to caregiver or vice versa) is addressed by any particular study. The relative degree of symmetry between partners within the same dyad, and changes in the degree and direction of dependence with development, have not been as extensively described. Further, little of this research has been done with dyads in which the baby is handicapped. Differences in the direction and degree of dependence between partners seems to be a particularly relevant area of study in dyads in which one partner may have to assume an even greater portion of the responsibility for initiating and maintaining social interaction, and in which there may be less change in roles over time. Such research could have major implications for understanding the potential impact of disabilities on social partners, on the structure of social interactions, and on the babies' development.

This session illustrates an initial attempt to use the z-score for constructing a visual picture which depicts simultaneously both directions of dependence within any given dyadic state, thus obtaining a more complete description of reciprocal interplay within the dyad, and a better understanding of the roles played by each partner, than is possible when dependence is examined from only one direction. Such an approach has potential for a more precise characterization of dyads and their individual members in relation to constructs such as reciprocity, responsiveness and contingency. Graphed across age levels, the procedure also shows promise for characterizing changes in the relative influence between partners.

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Several "bugs," primarily related to autocorrelation, have not yet been ironed out of the procedure. However, the results indicate that, given further refinement, it holds promise for capturing several important aspects of parent-infant interaction, and for displaying these in a readily understandable visual picture.

The approach taken was to divide the comparison of conditional to unconditional probabilities into four sets of z-scores derived from the same data, and then to plot these together for visual analysis. The four comparisons were based on defining dyadic states in terms of consecutive 1-second time intervals, rather than in terms of concurrent occurrence. These four sets include comparisons based on:

1. Mom at Time 1, Baby at Time 2
   a) Time 1 given Time 2 (mom/baby)
   b) Time 2 given Time 1 (baby/mom)
2. Baby at Time 1, Mom at Time 2
   a) Time 1 given Time 2 (baby/mom)
   b) Time 2 given Time 1 (mom/baby)

Dyadic gaze states were created for each combination of mother and baby gaze, including both joint gaze states (e.g., mutual gaze) and non-joint ones (e.g., mom look at baby-baby look away). This was done for each of two interactive situations, play and instructions with toys. Results for a dyad containing a baby with Down syndrome are shown in Figures 1-5. From Figure 1, it can be seen that, across all ages, the baby spent more time looking at the toy than at the mom, while there was a crossover effect in the percent of time that mom spent looking in these directions: at the younger age levels she looked more at the baby's face, while at the older she looked more at

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the toy. (The break in the baby's pattern at 12 months was related to a situational peculiarity: he was sitting on the toy--a rocking horse.) Looks away from the interaction were relatively uncommon, especially for the mother; for the baby, looking away decreased with time. It is clear that while the baby was a "toy watcher" all along, the mom switched only gradually from watching the baby's face to looking at the toy. The degree of change was stronger in instruction than in play.

Figures 2-5 contain graphs for each of the four types of z-scores described above, with Figures 2 and 3 showing joint and non-joint states during play, and Figures 4 and 5 showing joint and non-joint states during instruction. Each of these has been separated into two sets of graphs, the top one placing mom at Time 1 and baby at Time 2, and the lower doing the opposite. It should be noted that if one wanted to compare mother and baby in relation to some particular role (e.g., as"responder"), a different combination would be more useful.

Looking at Figures 2 and 3 (showing joint and non-joint states in the play situation), the nature of the relationship between behaviors within states changed during the 6-9 month period, with clear developmental trends emerging subsequent to that point. Behaviors within two of the three joint states became more likely to occur together than would be expected, while joint occurrence of those behaviors in the nonjoint states became less likely than would be expected. Hence, even though mom's looks at the baby decreased overall, they were more likely to occur in conjunction with his. At the younger age levels, she was unlikely to look at the toys even when he was. Her increasing looks at the toys at the older age

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levels occurred in conjunction with his. Overall, there was a shift from a framing pattern to one of matching. The exceptions to this overall shift were for joint looks away, which showed a more erratic pattern across age levels, and for the nonjoint state "baby look away-mom watch baby," which increased in strength; what appears to have occurred is that a pattern of monitoring the baby's face during looks away gradually replaced a pattern of following the baby's direction of looking. (It should be noted, however, that looking away was of very low occurrence for both partners, possibly distorting the z-scores.)

Still looking at Figures 2 and 3, but now comparing the top and bottom graphs in each, it can be seen that placing mom at Time 2 resulted in a separation in the strength of predictability, whereas the top graph in general did not. Although not shown here, the top graph is identical to that obtained by graphing dyadic states formed with behaviors occurring within the same second; separating the baby's gaze into potentially different roles resulted in no change in predictability. Thus, when baby was at Time 2, neither direction of prediction "carried" the interdependence to a greater effect than the other. That is, knowing where the baby would be looking in the second following any particular direction of mom looking was no more or less predictable than knowing where mom was looking in the second previous to any particular baby look. Looking at a similar separation of the mother's roles in the lower graph yields a different picture. In relation to mutual gaze, it appears that while more of the baby's looking was returned than we would expect based on how much he looked at mom, the relationship was not as strong the

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other way since she looked at him whether he is looking at her or not. This separation between the types of relationships between looks, while apparent in some instances at the younger age levels, was especially clear and consistent beginning at 9-12 months.

In Figures 4 and 5, depicting an instructional situation, while similar age trends are apparent, they were not as consistent. Given that the mom's behavior in this situation is determined to a greater extent by her own agenda, this result might be expected. It can be seen, however, that the same separation of roles occurred as in the play situation.

In general, it appears that mom's gaze behavior was more dependent on the baby's than vice versa, reflecting what might best be described as "availability" rather than as contingency. It is also clear that interdependence was, in general, more consistent in play than in instructional situations.

Overall, these results indicate that the procedure demonstrated here has potential for characterizing visually some very important aspects of mutual dependence. It may prove especially useful for characterizing and comparing different types of interdependence between diverse sets of interactive behaviors (e.g., vocal/vocal, gaze/vocal.) As noted above, the procedure has problems which must be addressed in further applications and through further modifications.

References

Gottman, J. M., & Bakeman, R. (1979). The sequential analysis of observational data. In M. Lamb, S. Suomi, & G. Stephenson (Eds.), Social interaction analysis: Methodological issues (pp. 185-206). Madison: University of Wisconsin Press.

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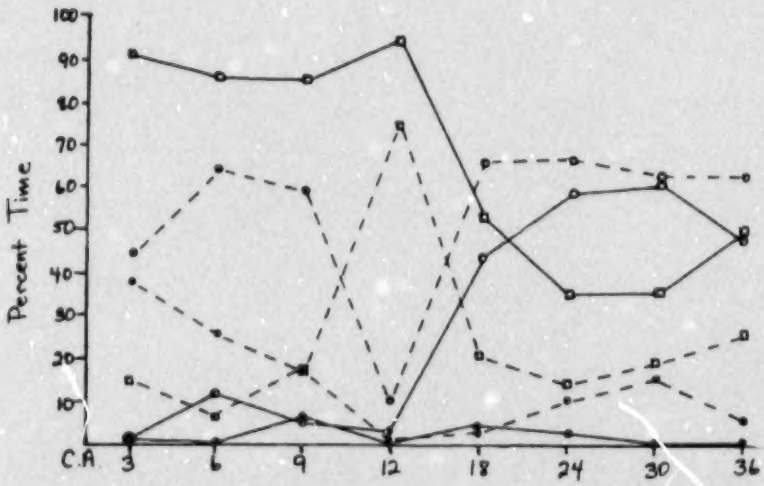
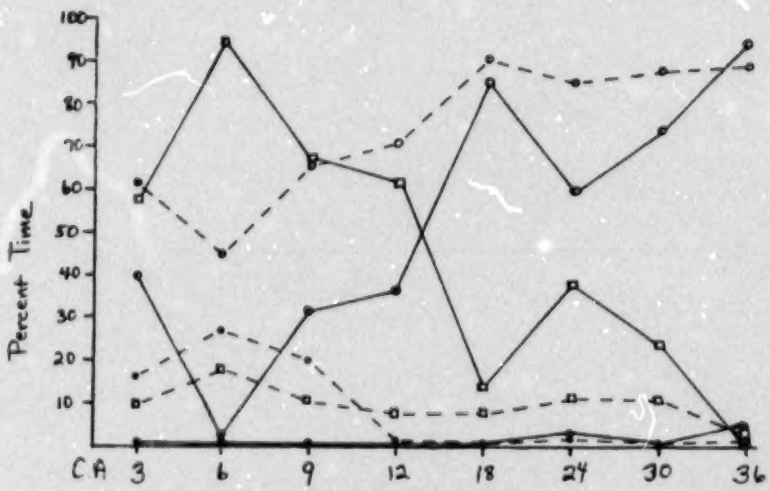
PERCENT OF INTERACTION TIME: EACH PARTNER'S DIRECTIONS OF LOOKING

Dyad with Down Syndrome Baby

Play Situation



Instruction Situation



Legend

--- baby

— mom

o look at toy

□ look at partner's face

• look away

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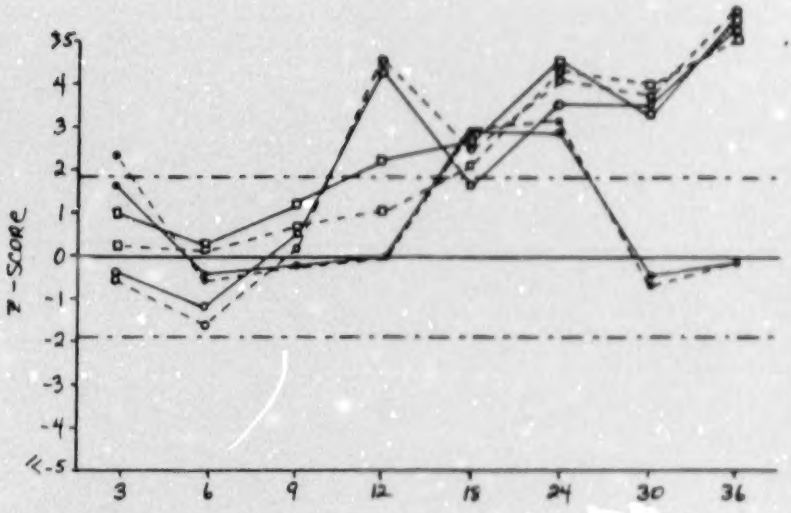
Figure 1

Joint Dyadic Gaze States Within Consecutive 1-Second Frames

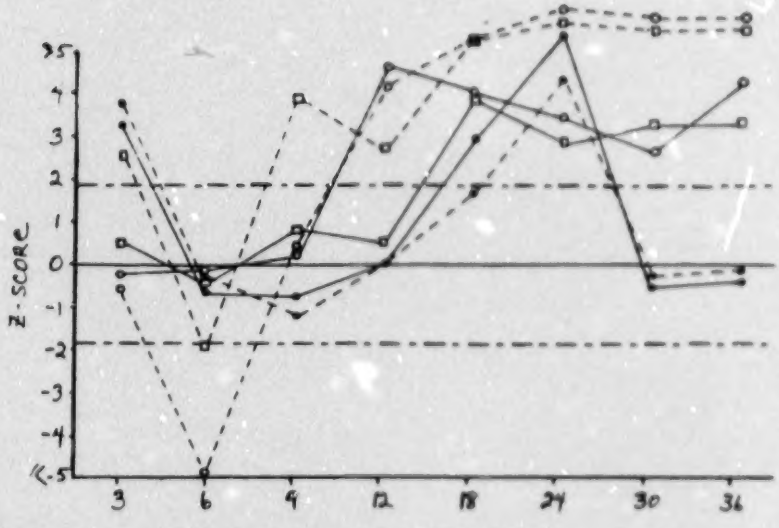
DYAD WITH DOWN SYNDROME BABY

Play

Mom at Time 1 - Baby at Time 2



Baby at Time 1 - Mom at Time 2



Legend

- □ mutual gaze
- ○ joint looking at toy
- • joint looks away

--- baby given mom
—— mom given baby

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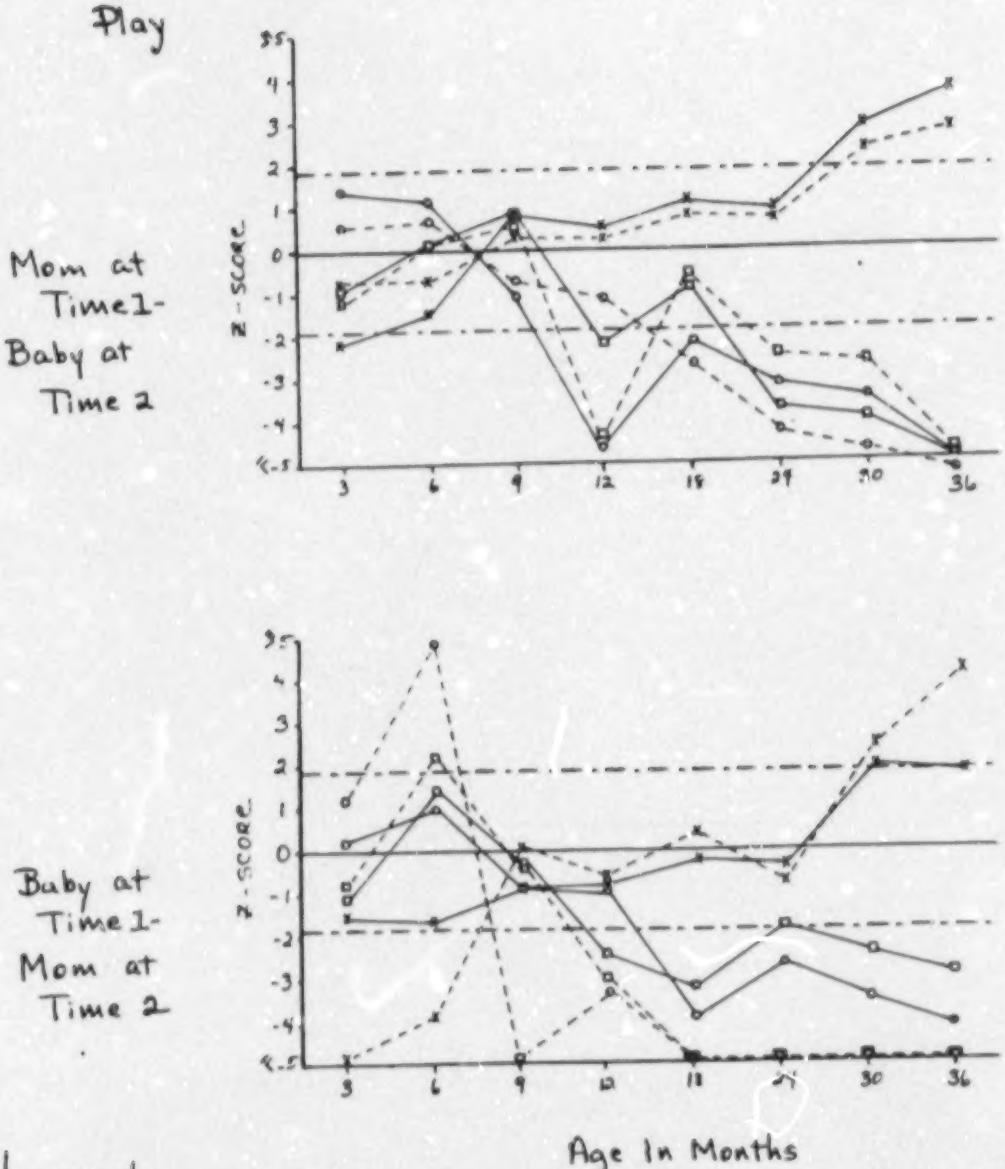
Figure 2

Non-Joint Dyadic Gaze States Within Consecutive 1-Second Frames

DYAD WITH DOWN SYNDROME BABY

Play



Legend

- ◻ baby look at mom - mom look at toy
- o baby look at toy - mom look at baby
- x baby look away - mom look at baby
- - - baby given mom
- —— mom given baby

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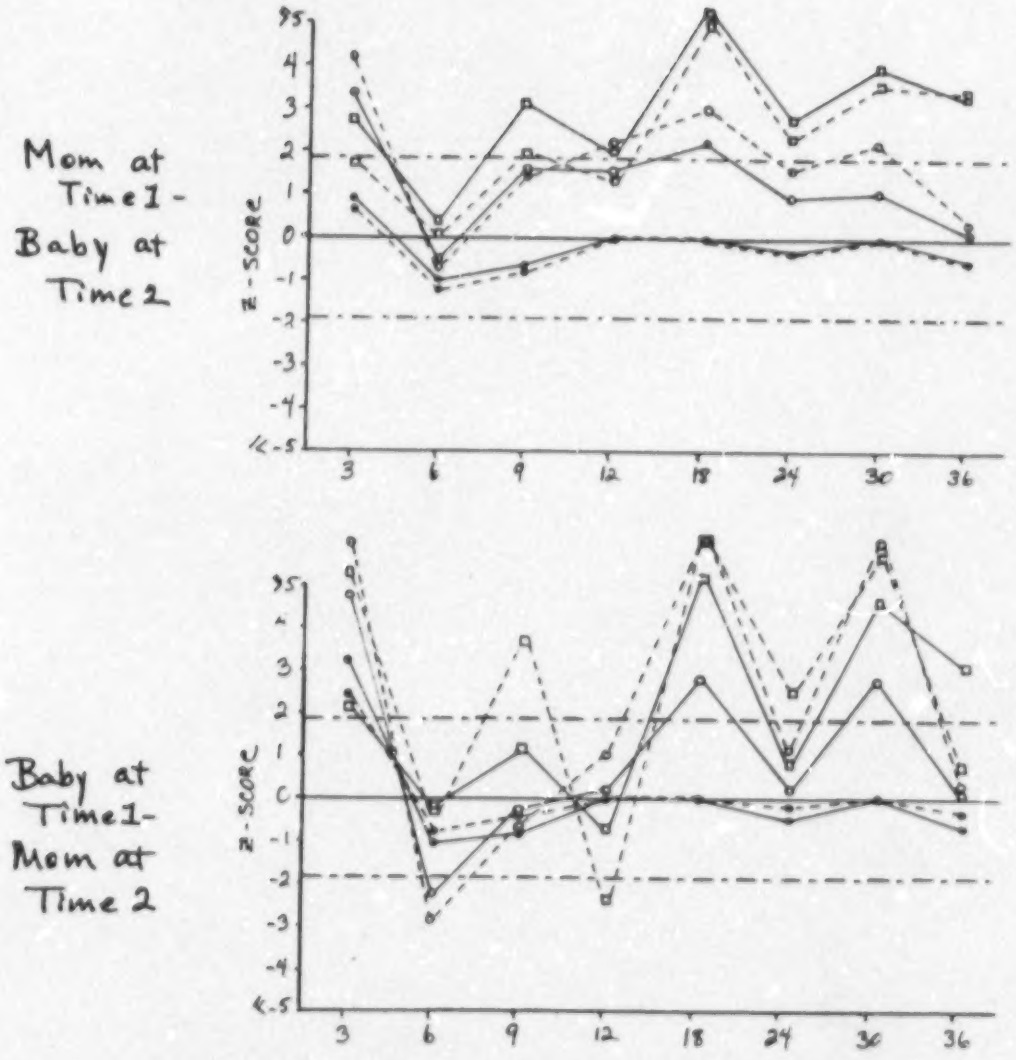
Figure 3

Joint Dyadic Gaze States Within Consecutive 1-Second Frames

DYAD WITH DOWN SYNDROME BABY

Instruction



Legend

- mutual gaze
- joint looking at toy
- joint looks away

--- baby given mom
—— mom given baby

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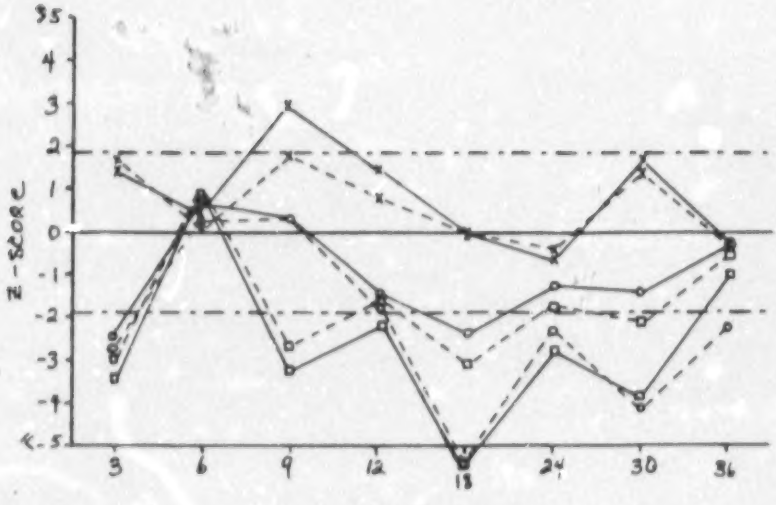
Figure 4

Non-Joint Dyadic Gaze States Within Consecutive 1-Second Frames

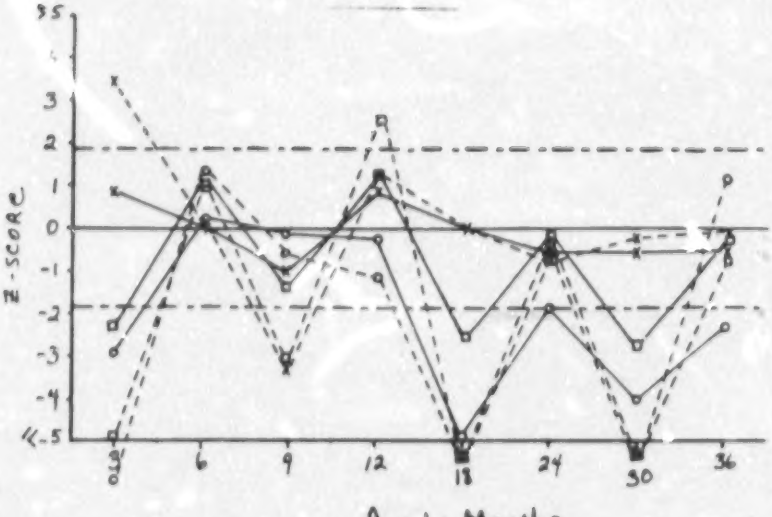
DYAD WITH DOWN SYNDROME BABY

Instruction

Mom at Time 1 - Baby at Time 2



Baby at Time 1 - Mom at Time 2



Legend

- ▫ baby look at mom - mom look at toy
- ○ baby look at toy - mom look at baby
- x baby look away - mom look at baby
- --- baby given mom
- —— mom given baby

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Figure 5